The diet of a Southern Boobook *Ninox novaeseelandiae* in Box-Ironbark country, central Victoria

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ABSTRACT

The diet of a Southern Boobook *Ninox novaeseelandiae* in a Box-Ironbark woodland remnant in central Victoria was studied. An analysis of 42.5 pellets found invertebrates to represent 82% of the total prey items, but vertebrates, in the form of the House Mouse *Mus domesticus*, to represent 88% of the biomass. The proportion of spiders as prey items in the diet in this instance (43%) was significantly higher than in other studies on mainland Australia.

Key words: Southern Boobook, dietary analysis, Lycosidae, wolf spiders

Introduction

The diet of Southern Boobooks *Ninox novaeseelandiae* on mainland Australia is little studied (McNabb 2002). Previous quantitative studies from Victoria include a variety of habitats, from coastal and pastoral areas of western Port Phillip Bay (Baker-Gabb 1984), riverine Black Box-River Red Gum country of northern Victoria (Calaby 1951) and wet and damp forests to the east of Melbourne (McNabb 2002).

Most previous studies in Australia have identified insects and small mammals as constituting the bulk of the diet (Higgins 1999; Penck and Queale 2002), although more recent research has shown mid-sized mammals and birds to constitute a larger portion of Southern Boobook diet than previously reported (McNabb 2002; Olsen *et al.* 2006).

This paper presents a dietary analysis of a Southern Boobook from the dry Box-Ironbark country of central Victoria, where this owl's diet has not previously been the subject of a detailed quantitative study. Elsewhere in the Victorian Box-Ironbark region, Southern Boobooks have been observed taking "roosting small birds, small mammals, frogs and large invertebrates such as moths and beetles" (Tzaros 2005; C. Tzaros, pers. comm. 2005). Although Robinson *et al.* (2003) state that Boobooks are "mostly insect-eating" in the eastern Victorian Box-Ironbark, this information is drawn from previously published accounts for the species across Australia (D. Robinson, pers comm. 2005).

Methods

An adult Southern Boobook was first disturbed from a roost site within the roof of an old dilapidated dwelling located within a woodland remnant at Creighton Hills (36^0 45' S, 145^0 29' E), 7 km west of Euroa, in central Victoria on 16 July 2005. The sex of the bird could not be determined and no pellets were searched for at this time. On revisiting the site on 30 July 2005, 42 whole pellets and one half pellet were collected from two piles approximately 2 m apart below the roost site within the dwelling (Fig. 1). As most of the roof and walls of the dwelling are missing the pellets were exposed to the elements. Subsequent visits to the site failed to locate either the roosting Boobook or further pellets.

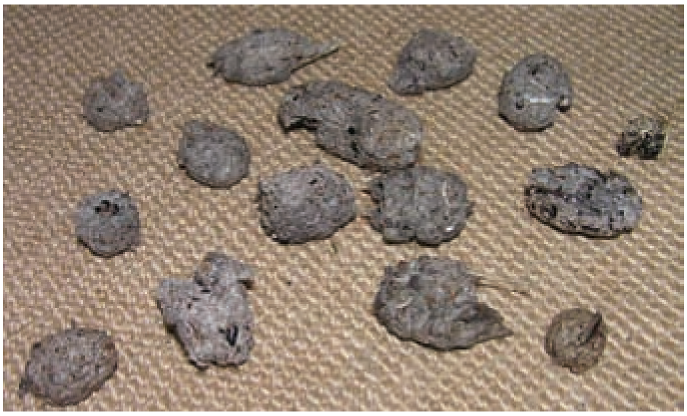

Figure 1. A sample of Southern Boobook pellets from Creighton Hills, Victoria.

The Creighton Hills woodland comprises ~130 ha of dry woodland/forest dominated by mainly regrowth Grey Box *Eucalyptus microcarpa* and Red Stringybark *E. macrorhyncha*, with smaller areas of Red Box *E. polyanthemos* and Blakely's Red Gum *E. blakelyi*. The woodland is largest remnant on the Longwood Plains, a heavily-cleared region in which only 5% of original vegetation remains (Ahern *et al.* 2003) (Fig. 2). However, the linear roadside and streamside vegetation present throughout the Longwood Plain (comprising Grey Box and River Red Gum *E. camaldulensis* respectively) is considered to be ecologically important in its own right (van der Ree and Bennett 2001). Boobooks are often heard calling in nearby roadsides and the bird may have been hunting in either the Creighton Hills woodland or the surrounding agricultural landscape.

Pellets were analysed by ABR, and the minimum numbers of individual prey items determined, by counting skeletal parts and by comparison with reference material.

Results

The 42 whole pellets measured 11-40 x 8-20 mm (mean 23.5 x 16.2 mm). Seventy-two individual prey items were recorded, comprising at least six distinct species (Table 1). Invertebrates constituted 82% of the prey items by number, with spiders (Araneae) representing 43% and beetles (Coleoptera) 29.2%. Wolf spiders (Lycosidae) were the most common prey item, representing 36.1% of the total prey individuals. House Mice *Mus domesticus* occurred in most pellets and represented 18.1% of the prey individuals identified. Some fragments of grass were also present in one pellet. By weight, House Mice contributed more than 88% of prey biomass, and spiders 6% (Table 1).

Discussion

The diet of the Southern Boobook at Creighton Hills consisted of mainly invertebrate prey (by number), although vertebrate prey represented a significant proportion of the total biomass. This broadly corresponds with studies elsewhere that invertebrates are the main prey item by number (e.g. Higgins 1999; Penck and Queale 2002). However, the results also support the findings by Olsen *et al.* (2006) and McNabb (2002) that the diet of Boobooks in south-eastern Australia is, by biomass, primarily vertebrates. The mean prey weight in this study is much lower than the mean prey weight in McNabb (2002) or Olsen *et al.* (2006) because the heaviest animal taken in this study was 17.5 g. The differences in the composition of prey items in Boobook dietary studies may in part reflect different methods of prey analysis and collecting prey remains (Olsen *et al.* 2006). For example, pellets were found to have proportionally less invertebrates than analysis of stomach contents (Rose 1996).

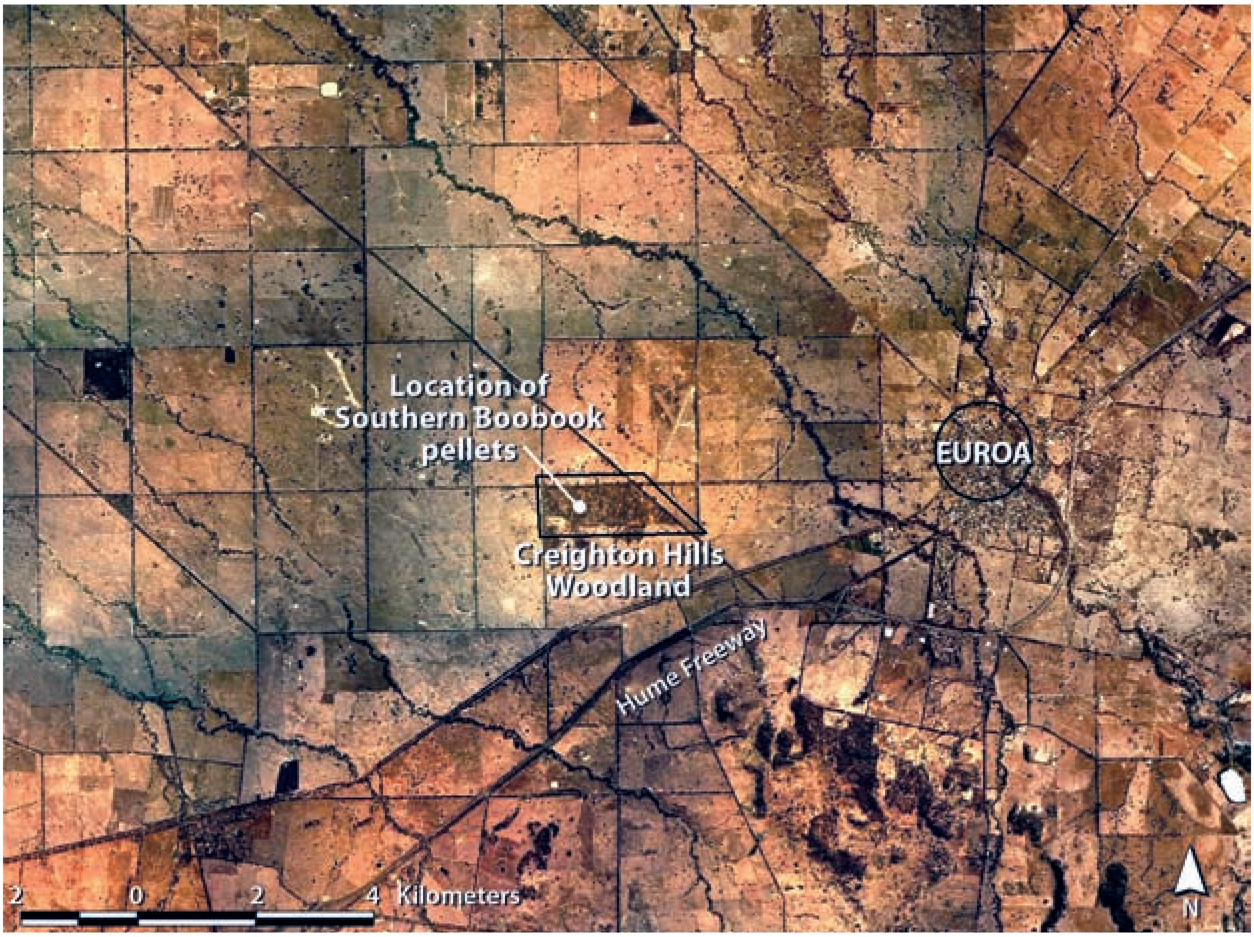

Figure 2. Location of the Creighton Hills Woodland within the landscape.

Table 1. Minimum number of prey individuals and biomass in pellets of a Southern Boobook at Creighton Hills, Euroa, June 2005.

Prey species	Minimum no. prey individuals	%	Ave weight of prey item (g)*	Total biomass (g)	% of total biomass
House Mouse *Mus domesticus*	13	18.1	17.5	227.5	88.5
Wolf spiders (Araneae: Lycosidae)	26	36.1	0.5	13	5.1
Undetermined spiders (Araneae)	5	6.9	0.5	2.5	1.0
Cockroaches (Blattodea)	3	4.2	0.5	1.5	0.6
Carab (ground) beetles (Coleptera: Carabidae)	9	12.5	0.5	4.5	1.8
Pie-dish beetle (Coleoptera:Tenebrionidae)	1	1.4	0.5	0.5	0.2
Unidentified beetles (Coleoptera)	11	15.3	0.5	5.5	2.1
Moth/butterfly (Lepidoptera)	4	5.6	0.5	2	0.8
Total	72	100		257	100

*Weight estimates from Menkhorst and Knight (2001), Framenau *et al.* (2000), McNabb (2002)

The high proportion of wolf spiders in this study is of particular note. Other studies in Victoria have found spiders to represent only a very small proportion of the overall dietary items (Baker-Gabb 1984; 1985 – 3%; Calaby 1951 – one record in a small number of pellets; none specified by McNabb 2002, although he noted that traces of small insect remains below roosts were not analysed), as they have been in other mainland states (Campbell and Rose 1996; Rose 1996; Penck and Queale 2002; Olsen *et al.* 2006). However, Green *et al.* (1986) found trap-door spiders (Ctenizidae) to be abundant in the pellets of Tasmanian Southern Boobook *Ninox novaeseelandiae leucopsis* in summer, while spiders represented 5.9% and 9.7% of prey items in two studies of New Zealand Moreporks *N. n. novaeseelandiae* (Haw and Clout 1999; Haw *et al.* 2001). There are several wolf spider species found in the Victorian Box-Ironbark region (Shield 2001), and the family is known to have a diversity of species in both vegetated and non-vegetated components of fragmented landscapes (Major *et al.* 2006).

Interestingly, Penck and Queale (2002) suggest that prey with few or no body parts (e.g. Lepidoptera or Araneae) may be found in lower frequencies in owl pellets than in gizzards. In this study, spiders, identified by jaw parts (chelicerae), represented 43% of prey items and were found to occur in 24 pellets.

No native vertebrates were detected in the diet in this study, despite the area being known to contain important populations of small arboreal and terrestrial species such as the Yellow-footed Antechinus *Antechinus flavipes*, Brush-tailed Phascogale *Phascogale tapoatafa*, Squirrel *Petaurus norfolcensis* and Sugar Gliders *P. breviceps* (van der Ree 2000; 2003; van der Ree *et al.* 2001; van der Ree and Bennett 2003) and despite Boobooks taking a variety of often cryptic vertebrate prey in other, more forested parts of Victoria (McNabb 2002).

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References

Ahern, L.D., Berwick, S., Robinson, D., Howell, M. and Handley, K. 2003. *Landscape Plan for the Longwood Landscape Zone.* Department of Sustainability & Environment, Melbourne.

Baker-Gabb, D.J. 1984. The feeding ecology and behaviour of seven species of raptor overwintering in coastal Victoria. *Australian Wildlife Research* **11**: 517-532.

Baker-Gabb, D.J. 1985. Accessory publication: The feeding ecology and behaviour of seven species of raptor overwintering in coastal Victoria. *Australasian Raptor Association News* **6(1)**: 4-9.

Calaby, J.H. 1951. Notes on the Little Eagle; with a particular reference to rabbit predation. *Emu* **51**: 33-56.

Campbell, B. and Rose, A.B. 1996. Diet of the Southern Boobook *Ninox novaeseelandiae* on the north coast of New South Wales. *Australian Bird Watcher* **16**: 349-351.

Framenau, V.W., Finley, L.A., Allan, K., Love, M., Shirley, D. and Elgar, M.A. 2000. Multiple feeding in wolf spiders: the effect of starvation on handling time, ingestion rate, and intercatch intervals in Lycosa lapidosa (Araneae:Lycosidae). *Australian Journal of Zoology* **48:** 59-65.

Green, R.H., Rainbird, J.L. and McQuillan, P.B. 1986. Food of the Southern Boobook *Ninox novaeseelandiae*. *Tasmanian Naturalist* **86**: 1-3.

Haw, J.M. and Clout, M.N. 1999. Diet of Morepork (*Ninox novaeseelandiae*) throughout New Zealand by analysis of stomach contents. *Notornis* **46**: 333-345.

Haw, J.M., Clout, M.N. and Powlesland, R.G. 2001. Diet of Moreporks (*Ninox novaeseelandiae*) in Pureora Forest determined from prey remains in regurgitated pellets. *New Zealand Journal of Ecology* **25**: 61-67.

Higgins, P.J. (Ed.) 1999. *Handbook of Australian, New Zealand and Antarctic Birds. Volume 4. Parrots to Dollarbird*. Oxford University Press, Melbourne.

Major, R.E., Gowing, G., Christie, F.J., Gray, M. and Colgan, D. 2006. Variation in wolf spider (Araneae: Lycosidae) distribution and abundance in response to the size and shape of woodland fragments. *Biological Conservation* **132**: 98-108.

Menkhorst, P. and Knight, F. 2001. *Field Guide to the Mammals of Australia*. Oxford University Press, Melbourne.

McNabb, E.G. 2002. Notes on the diet and observations of the Southern Boobook (*Ninox novaeseelandiae*) in southern Victoria. pp. 192-198 in: *Ecology & Conservation of Owls*, edited by I. Newton, R. Kavanagh, J. Olsen and I. Taylor. CSIRO Publishing, Collingwood.

Olsen, J., Fuentes, E., Rose, A.B. and Trost, S. 2006. Food and hunting of eight breeding raptors near Canberra, 1990-1994. *Australian Field Ornithology* **23**: 77-95.

Penck, M. and Queale, L.F. 2002. The diet of Southern Boobooks in South Australia. *Emu* **102**: 355-360.

Robinson, D., Stothers, K. and Howell, M. 2003. *A Wildlife Guide for Landholders in the Plains and Box-Ironbark Regions of the Goulburn Broken Catchment*. Goulburn Broken Catchment Management Authority, Shepparton.

Rose, A.B. 1996. Notes on the diet of the Southern Boobook *Ninox novaeseelandiae* in New South Wales. *Australian Bird Watcher* **16**: 339-343.

Shield, J.M. 2001. *Spiders of Bendigo and Victoria's Box Ironbark Country*. Bendigo Field Naturalists Club, Bendigo.

Tzaros, C. 2005. *Wildlife of the Box-Ironbark Country*. CSIRO Publishing, Melbourne.

van der Ree, R. 2000. Ecology of Arboreal Marsupials in a Network of Remnant Linear Habitats. PhD thesis. School of Ecology & Environment, Deakin University, Melbourne. Available: http://tux.lib.deakin.edu.au/adt-VDU/public/adt-VDU20050804.104814/index.html

van der Ree, R. 2003. The occurrence of Yellow-footed Antechinus *Antechinus flavipes* in remnant linear habitats in north-eastern Victoria. *Australian Mammalogy* **25**: 97-100.

van der Ree, R. and Bennett, A.F. 2001. Woodland remnants along roadsides: A reflection of pre-European structure in temperate woodlands? *Ecological Management & Restoration* **2**: 224-226.

van der Ree, R. and Bennett, A.F. 2003. Home range of the Squirrel Glider *Petaurus norfolcensis* in a network of linear habitats. *Journal of Zoology (London)* **259**: 327-336.

van der Ree, R., Soderquist, T. and Bennett, A.F. 2001. Home-range use by the Brush-tailed Phascogale (*Phascogale tapoatafa*) (Marsupialia) in high-quality, spatially limited habitat. *Wildlife Research* **28**: 517-525.